

Quest for the sun: UW-Milwaukee students design home for 2009 Solar Decathlon

By Kristine Sobczak

The brightest young minds in architecture and engineering at the University of Wisconsin – Milwaukee (UWM) are waging a battle for the sun, aiming to capture its powerful energy to sustain their newly created, ultramodern, carbon-neutral home in the 2009 Solar Decathlon competition in October.

The Solar Decathlon, an educational project of the U.S. Department of Energy, is a global contest held every other year in which university student teams compete to design, build and operate the most attractive and energy-efficient solar-powered house. Teams make every effort to be creative and innovative, hoping their ideas will spark new technologies and design elements that maximize energy efficiency.

Of the 40 teams that applied for consideration, 20 were chosen to build their designs. This year's teams represent universities in the United States, Puerto Rico, Spain, Canada and Germany. After an extensive amount of planning and building, entrants will assemble their homes at the Solar Village on the grounds of the National Mall in Washington, D.C., where each home will be judged and toured extensively.

The UWM team has named its home "Meltwater," in tribute to the glaciers that carved out Wisconsin. Architecture and engineering professors, along with more than 150 students, have been working on Meltwater for almost two years. In the process, they say they've learned to melt a few of the barriers that can sometimes hinder their two professions from working together in the most efficient manner. With all the learning, researching, fundraising and building that has taken place to keep the project moving, they've learned much about cooperation, collaboration, and speaking and understanding each discipline's technical language. By this fall, they'll have a high-performance home that produces more energy than it uses to show for their efforts – and if all goes well, a good showing in the Solar Decathlon.

Creating an Energy-Efficient House of Style and Substance

Meltwater is the culmination of hundreds of ideas, whittled down to the most workable, innovative, energy-efficient solutions. The house will top out at about 800 square feet, the maximum allowed in the competition. The UWM team designed Meltwater for a retired couple, perhaps living near family members in a sort of “carriage house” concept. It’s designed to withstand Wisconsin’s harsh winters and sometimes steamy summers – all while taking advantage of the best in energy-efficient technology.

“My favorite aspect of the house is the way we placed the energy-saving features on the home,” said Greg Thomson, assistant professor of architecture and faculty advisor for the project. “You see many of them right away on the outside of the home. It immediately sparks conversation.”

Another feature designed to get people talking is Meltwater’s use of modular design and furnishings that can neatly fold into the walls. Rooms can easily transform from one function to another, maximizing space and practicality.

“Being a small house, we wanted to make it appear larger and more inviting,” said Eric Davis, student engineering leader. “We also wanted it to feel like a ‘social’ house.”

One feature that helps them achieve those objectives is a series of computer-programmed, custom-made doors that face the west. The doors open to make the home feel more inviting and airy, but they have an impressive higher purpose.

“It’s a totally novel, new shading system that tracks the sun, with the doors closing just enough to provide optimal shading,” said Vishal Rana, one of the designers of the shading system and mechanical systems project lead.

To further assist with energy efficiency and also help with the quick assembly of the home, the team is using structurally insulated panels, or SIPs.

“They’re highly efficient and are prefabricated to fit the walls,” said Rana. With the tight 97-hour timeframe the team has to assemble the home at the decathlon, they’re eager to find the quickest, most efficient ways to build their home.

In choosing the best solar water heating system for the house, the Meltwater team turned to Caleffi, whose North American headquarters are in Milwaukee.

“Since water heating is one of the biggest users of energy, we knew we needed a well-designed system to handle the job,” said Rana. He said the team will be judged on its ability to maintain a 110° water temperature for 45 gallons of water for 30 minutes – at any point in the day during which the judges decide to check the water.

Thomson said the team opted for Caleffi’s solar thermal system because of its user-friendliness.

“We really like the way Caleffi’s system is put together as a package,” Thomson said. “The panels, tank, controls and everything we need come as one unit, so we don’t have to piece anything together.”

Rex Gillespie, director of marketing for Caleffi, was eager to be involved with the project.

“We are supporting it because we feel it’s a worthy opportunity for the students to learn about solar water heating, as well as the significance of the sun as a vast source of renewable energy,” Gillespie said.

The UWM team is grateful for companies like Caleffi and WE Energies, the large public utility serving much of Wisconsin and the project’s lead sponsor, that have extended their financial and product support. With a total project budget of \$650,000, funding from corporate sponsors and individuals has been vital.

The Big Move and Competition

The team is busy preparing for Sept. 25 when five semi trucks will drive onto the UWM campus and begin the moving process. Four trucks will handle large sections of the house, while a fifth semi will transport the roof. The trucks will be restricted to traveling at designated hours, helping minimize the inconvenience of having such a large load on the roadways. Just before midnight on Sept. 30, teams can begin assembling their homes. A large crane will be brought onto the National Mall to help the UWM team snap together Meltwater in a somewhat “Lego-esque” fashion. By 11:59 p.m. on Oct. 4, the assembly must be completed.

When judging begins, each team will be evaluated in 10 categories, from which the decathlon gets its name. Judging categories include: architecture, engineering, market viability, communications, comfort, appliances, hot water, lighting, home entertainment and energy balance.

Adding a practical element to the competition, each team will host neighboring contestants for a dinner party and movie night in its home, further exhibiting the structure's livability.

At least 150,000 people, from engineers and designers to political figures and the general public, are expected to tour the homes this fall, receiving an eye-opening demonstration of the possibilities of solar energy.

As for their chances of winning, the students from UWM are hopeful.

"To win this contest, you have to be practical," said Rana.

"We want to win ... we're pushing to win ... but our house has to be livable," added Davis. "If we're in the top half, I'm okay with that."

No matter who takes the top prize, there will still be a lot of winners. New technology emerges from the competition and more people are exposed to better energy options for the future. As for Meltwater, it will find a permanent home in Milwaukee's Menomonee Valley at the Urban Ecology Center where it will likely become a conference site or remote classroom. It will be a showcase for some of the best technology commercially available, as well as a glimpse of bright concepts to come.

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